REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-19 are currently pending. Claim 2 has been amended by the present amendment. The changes to Claim 2 are supported by the originally filed specification and do not add new matter.

In the outstanding Office Action, Claims 1-4, 8, 9, and 11-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,535,066 to Petsko (hereinafter "the '066 patent") in view of U.S. Patent No. 6,175,551 to Awater et al. (hereinafter "the '551 patent") and U.S. Patent No. 6,266,633 to Higgins et al. (hereinafter "the '633 patent"); Claims 5 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the '066, '551, and '633 patents in further view of U.S. Patent Application Publication No. 2003/0210647 to Yang et al. (hereinafter "the '647 application"); Claims 6, 7, 17, and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the '066, '551, and '633 patents in further view of the '647 application and U.S. Patent Application Publication No. 2002/0136278 to Nakamura et al. (hereinafter "the '278 application"); and Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the '066, '551, and '633 patents in further view of U.S. Patent Application Publication No. 2007/0053458 to Taunton (hereinafter "the '458 application").

REJECTION UNDER 35 U.S.C. § 103

Claim 1 is directed to an orthogonal frequency multi-carrier transmitting apparatus which arranges plural symbols to be transmitted on the frequency axis as plural sub-carrier signal components of a frequency interval equal to the symbol rate, then converts them to

time domain signals, then up converts these signals and amplifies their power, thereafter

transmitting them, comprising:

>an inverse Fourier transform part which transforms said plural sub-carrier signal components to plural time domain signal components;
>
>a peak component detecting part which compares each of said plural time domain signals with a predetermined permissible peak level to detect peak components exceeding said permissible peak level;
>
>a Fourier transform part which transforms said peak components to frequency domain components corresponding to said sub-carrier signal components; and
>
>subtracting means which subtract said frequency domain components from said plural sub-carrier signal components to be input to said inverse Fourier transform part, thereby suppressing the peak component of the transmitting output.

Regarding the rejection of Claim 1 under 35 U.S.C. § 103(a), the Office Action

acknowledges, and it is respectfully submitted, that the '066 patent fails to disclose the

inverse Fourier transform part, the peak component detecting part, the Fourier transform part,

and the subtracting means defined in Claim 1.[1] Rather, the Office Action cites the '551 and

'633 patents for such teachings.

The '551 patent is directed to a transmission system and method employing peak

cancellation to reduce the peak-to-average power ratio. In particular, the Office Action cites

the '551 IFFT 28 for teaching the claimed inverse Fourier transform part; the '551 peak

detector 52 for teaching the claimed peak component detecting part; and the '551 FFT 58 for

teaching the claimed Fourier transform part.[2]

However, it is respectfully submitted that the '551 patent fails to disclose <u>a Fourier</u>

<u>transform part which transforms said peak components (detected by a peak component</u>

<u>detection part) to frequency domain components corresponding to said sub-carrier signal</u>

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[1] See Office Action dated January 23, 2009, pages 3 and 4.
[2] Id. at page 5.

components. Rather, the '551 patent simply discusses a transmission system in Fig. 4 wherein a peak detector 52 compares the output of IFFT 28 with a permissible peak level (threshold value) to generate, by an impulse generator 54, peak components at sample positions where sample levels exceed the permissible peak level.[3] That is, the '551 patent discusses that impulses of levels which are equal to differences between the permissible peak level and the detected peaks are generated. The '551 patent does not disclose that *peak components* (detected by the '551 peak detector 52) *are transformed into frequency domain components* by the '551 FFT 58.

Further, as apparently acknowledged by the Office Action, the '551 patent fails to disclose <u>subtracting means which subtract said frequency domain components from said plural sub-carrier signal components to be input to said inverse Fourier transform part, thereby suppressing the peak component of the transmitting output</u>. Rather, the '551 patent simply discusses that impulses are processed by a filter block 56 and the output of the filter block 56 is subtracted by an adder 64 from the output of the IFFT 28 to suppress peak components in the output of the IFFT 28.[4] That is, in the '551 patent, signals corresponding to the peak components in the time domain are subtracted from the output of the IFFT 28 in the same time domain. The '551 patent does not disclose *subtracting frequency domain components from plural sub-carrier signal components to be input to an inverse Fourier transform part*, as defined in Claim 1.

For example, it can be said that the '551 subtraction process is a kind of feed forward processing, which has drawbacks as follows: The subtraction of the peak components in the time-domain output of the IFFT causes clipping noises to be generated across inside and outside the signal frequency band. The clipping noises in the outside bands may be

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[3] See '551 patent, column 4, lines 59-66.
[4] Id. at column 4, line 66 to column 5, line 9.

eliminated by a filter, but it is difficult to eliminate clipping noises inside the signal frequency band.

On the other hand, for a non-limiting example of the claimed invention, peak components in the output of an IFFT are detected and transformed into frequency domain components by the FFT 23 and those frequency domain components are subtracted by the subtracting means from the sub-carrier signal components (i.e., the input signals to the IFFT; in this sense it can be said that the processing is a feedback processing) in the same frequency domain so that the peak components in the time domain can be reduced without causing clipping noises.

Moreover, it is respectfully submitted that the '633 patent fails to remedy the deficiencies of the '066 and '551 patents, as discussed above. The '633 patent is directed to a method and apparatus of a noise suppression and channel equalization preprocessor for speech and speaker recognizers. In particular, the Office Action cites the '633 spectral subtraction (SS) module 100 for teaching the claimed subtracting means.

However, it is respectfully submitted that the '633 patent fails to disclose subtracting means which subtract said frequency domain components from said plural sub-carrier signal components to be input to said inverse Fourier transform part, thereby suppressing the peak component of the transmitting output. Rather, the '633 patent simply discusses that the SS module 100 operates on saved magnitude spectra data and a noise estimate by subtracting from each m_{ft} the noise floor N_f determined in module 80 and setting any negative results to zero to provide a noise-suppressed signal sequence 104. Further, the '633 patent discusses a blind deconvolution filter 110 is coupled to the output of the SS module 100 and operates by multiplying the SS processed magnitude sequence 104 by a BD filter frequency response.[5] The '633 patent does not disclose that the SS module 100 *subtracts frequency domain*

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[5] See '633 patent, column 7, lines 55-63.

components (detected peak components transformed by a Fourier transform part) from plural

sub-carrier signal components to be input to an inverse Fourier transform part (which

transforms the plural sub-carrier signal components to plural time domain signal

components), as defined in Claim 1.

Thus, no matter how the teachings of the '066, '551, and '633 patents are combined,

the combination does not teach or suggest the Fourier transform part and the subtracting

means defined in Claim 1. Accordingly, it is respectfully submitted that independent Claim 1

(and all associated dependent claims) patentably defines over any proper combination of the

'066, '551, and '633 patents.

Claim 9 recites, in part,

> (c) a step of Fourier-transforming said peak components
> to frequency domain components corresponding to said sub-
> carrier signal components; and

> (d) a step of subtracting said frequency domain
> components from said plural sub-carrier signal components to
> thereby suppress the peak component of a transmitting output.

As noted above, the '066, '551, and '633 patents, alone or in proper combination, fail

to disclose the Fourier transform part and the subtracting means defined in Claim 1. Thus,

the '066, '551, and '633 patents fail to disclose the steps (c) and (d) defined in Claim 9.

Accordingly, it is respectfully submitted that independent Claim 9 (and all associated

dependent claims) patentably defines over any proper combination of the '066, '551, and

'633 patents.

Regarding the rejection of Claim 2 under 35 U.S.C. § 103(a), the Office Action

apparently acknowledges, and it is respectfully submitted, that the '066 and '551 patents fail

to disclose the peak component detecting part defined in Claim 2. Rather, the Office Action

cites the '633 patent for such a teaching.[6] However, it is respectfully submitted that the '633

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[6] See Office Action dated January 23, 2009, page 6.

patent fails to remedy the deficiencies of the '066 and '551 patents. The '633 patent is directed to preprocessing of speech data in a speech recognition system, not OFDM or OFCDM. Further, the '633 preprocessing is directed to <u>noise suppression</u> in the frequency domain, not the suppression of peak power.

Further, in the '663 preprocessing, speech utterances are subjected to FFT to generate a histogram of magnitude associated with each spectrum as shown in Fig. 4 and a noise floor N_f is determined based on the shape of the histogram distribution, then differences m_{fi}-N_f are calculated while negative values are replaced with zeros. The '663 speech processing allows the speech recognition rate to be improved. However, the '663 patent does not disclose detecting peak components in a time domain output of an IFFT which are higher than a permissible peak level. Thus, the '663 patent does not disclose the peak component detecting part defined in Claim 2. Accordingly, it is respectfully submitted that dependent Claim 2 patentably defines over any proper combination of the '066, '551, and '633 patents.

Regarding the rejection of Claim 3 under 35 U.S.C. § 103(a), the Office Action apparently acknowledges, and it is respectfully submitted, that the '066 and '551 patents fail to disclose the permissible peak level setting part defined in Claim 3. Rather, the Office Action cites the '633 patent for such a teaching.[7] However, it is respectfully submitted that the '633 patent fails to remedy the deficiencies of the '066 and '551 patents. In particular, the cited '633 estimation of the noise floor based on magnitude spectra is not equivalent to the determination of a permissible peak level based on the power of a power-amplified transmitting signal. Accordingly, it is respectfully submitted that dependent Claim 3 patentably defines over any proper combination of the '066, '551, and '633 patents.

Regarding the rejections of Claim 4 and 12 under 35 U.S.C. § 103(a), the Office Action apparently acknowledges, and it is respectfully submitted, that the '066 and '551

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[7] See Office Action dated January 23, 2009, page 7.

patents fail to disclose the Fourier-transformed output signal control part, as defined in Claims 4 and 12. Rather, the Office Action cites the '633 patent for such a teaching.[8] However, in the '633 patent, the noise floor N_f is subtracted from the magnitude spectra to suppress noises in the frequency domain. The '633 patent does not disclose that levels of frequency domain components are regulated to be equal to or lower than a peak-reduced signal permissible level. Accordingly, it is respectfully submitted that dependent Claims 4 and 12 patentably define over any proper combination of the '066, '551, and '633 patents.

Regarding the rejections of Claims 8, 11, 13, 14, and 15 under 35 U.S.C. § 103(a), the Office Action apparently acknowledges, and it is respectfully submitted, that the '066 and '551 patents fail to disclose the features of Claims 8, 11, 13, 14, and 15. Rather, the Office Action cites the '633 patent for such teachings.[9] However, it is respectfully submitted that the '633 patent fails to remedy the deficiencies of the '066 and '551 patents. For a non-limiting example, as explained at page 20, line 13 of the originally filed specification, every input symbol assumes either one of a plurality of predetermined values (e.g., 00, 01, 10, 11). The claimed invention takes advantage of this fact and calculates, in advance, IFFT, peak values, FFT, and subtraction for every possible set of said symbol values. In the '663 system, N_f may be determined from the histogram of magnitude spectra m_{fi} of speech utterances stored in a memory; however, since the input digital signal to the system is of natural utterances of speech by a human, it would not be possible to precalculate the processing of FFT 60, frequency-domain processing 63 and IFFT 140 in Fig. 2A. Accordingly, it is respectfully submitted that dependent Claims 8, 11, 13, 14, and 15 patentably define over any proper combination of the '066, '551, and '633 patents.

Regarding the rejection of Claim 5 under 35 U.S.C. § 103(a), the Office Action acknowledges, and it is respectfully submitted, that the '066, '551, and '633 patents fail to

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[8] See Office Action dated January 23, 2009, page 7.
[9] Id.

disclose the plural copying parts, the spreading code generating part, and the multiplying means defined in Claim 5. Rather, the Office Action cites the '647 application for such a teaching.[10] However, it is respectfully submitted that the '647 application fails to disclose plural copying parts each of which copies one of said plural symbols to a number SF that is equal to the value of a spreading factor, said SF being an integer equal to or greater than 1. Rather, the '647 application simply discusses a two-dimensional spreading code matrix of MxN chips where N (number of columns) represents the number of chips per symbol and M (number of rows) represents the number of frequency carriers. It is apparent from Fig. 1A that each of the rows of code matrix shown in Fig. 1B is supplied as a 1xN spreading code vector to the corresponding one of the M multiplying pairs in the multiplier 14. The '647 application does not disclose *copying symbols to be transmitted*. Accordingly, it is respectfully submitted that dependent Claim 5 patentably defines over any proper combination of the '066 patent, the '551 patent, the '633 patent, and the '647 application.

Dependent Claim 16 recites features analogous to the features recited in dependent Claim 8. Further, it is respectfully submitted that the '647 application fails to remedy the deficiencies of the '066, '551, and '633 patents, as discussed above. Moreover, the Office Action does not cite the '647 application for those deficiencies. Accordingly, it is respectfully submitted that dependent Claim 16 patentably defines over any proper combination of the '066 patent, the '551 patent, the '633 patent, and the '647 application.

Dependent Claim 6 recites features analogous to the features recited in dependent Claim 5. Further, it is respectfully submitted that the '278 application fails to remedy the deficiencies of the '066 patent, the '551 patent, the '633 patent, and the '647 application, as discussed above. Moreover, the Office Action does not cite the '278 application for those deficiencies. With respect to the '278 application, it is noted that Figs. 1, 3, and 4 cited in the

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[10] See Office Action dated January 23, 2009, page 9.

Office Action do not relate to a transmitter, but relate to a receiver. The '278 application discusses, in paragraph [0003] and with reference to Fig. 11, spreading symbols of each sequence with a user identifier code (short code) and a channel identifier code (long code). Accordingly, it is respectfully submitted that dependent Claim 6 (and dependent Claim 7) patentably defines over any proper combination of the '066 patent, the '551 patent, the '633 patent, the '647 application, and the '278 application.

Dependent Claims 17 and 18 recite features analogous to the features recited in dependent Claim 8. Further, it is respectfully submitted that the '647 and '278 applications fail to remedy the deficiencies of the '066, '551, and '633 patents, as discussed above. Moreover, the Office Action does not cite the '647 and '278 applications for those deficiencies. Accordingly, it is respectfully submitted that dependent Claims 17 and 18 patentably define over any proper combination of the '066 patent, the '551 patent, the '633 patent, the '647 application, and the '278 application.

Regarding the rejection of Claim 10 under 35 U.S.C. § 103(a), the Office Action acknowledges, and it is respectfully submitted, that the '066, '551, and '633 patents fail to disclose that <u>steps (a), (b) and (c) are repeatedly performed until the levels of all of said plural time domain signal components become equal to or lower than said permissible peak level in said step (b)</u>. Rather, the Office Action cites the '458 application for such a teaching. In the '458 transmission system, such a regeneration as over sampling and signal filtering is repeated until peaks exceeding a threshold at the output of IFFT diminish below the threshold.[11] The '458 application does not disclose performing FFT on the detected peak components in the output of IFFT or subtracting the outputs of FFT from the inputs of the IFFT. That is, the '458 application does not disclose steps (c) and (d) recited in Claim 9,

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[11] See '458 application, paragraph [0034].

which are also not disclosed or suggested by the '066 patent, the '551 patent, and the '633

patent, as discussed above with respect to Claim 1.

CONCLUSION

Thus, it is respectfully submitted that independent Claims 1 and 9 (and all associated

dependent claims) patentably define over any proper combination of the applied references.

Consequently, in view of the present amendment and in light of the above discussion,

the outstanding grounds for rejection are believed to have been overcome. The application as

amended herewith is believed to be in condition for formal allowance. An early and

favorable action to that effect is respectfully requested.
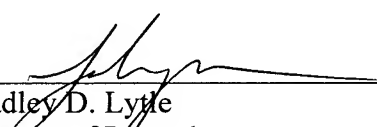

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